

industry, or other interested parties concerning the biological status of this species. The Service will complete the status review and publish its finding no later than November 15, 1994.

Authors

This notice was prepared by Ms. Anne Vandehey at the Service's Helena Office (see ADDRESSES above) and Dr. James L. Miller, U.S. Fish and Wildlife Service, P.O. Box 25486, Denver Federal Center, Denver, Colorado 80225.

Authority

The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1544).

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Dated: January 26, 1994.

John L. Spinks, Jr.,

Deputy Regional Director.

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Fish and Wildlife Service

50 CFR Part 17

RIN 1018-AC34

Endangered and Threatened Wildlife and Plants; Proposed Endangered Status for the California Red-legged Frog

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: The U.S. Fish and Wildlife Service (Service) proposes to determine the California red-legged frog (*Rana aurora draytonii*) as endangered pursuant to the Endangered Species Act of 1973, as amended (Act). The California red-legged frog is found primarily in wetlands and streams in coastal drainages of central California. It has been extirpated from 75 percent of its former range. This subspecies is threatened throughout its remaining range by a wide variety of human impacts, including urban encroachment, construction of reservoirs and water diversions, introduction of exotic predators and competitors, and stochastic events. This proposed rule, if made final, would extend the Act's protection to the California red-legged frog. The Service seeks data and comments from the public on this proposed rule.

DATES: Comments from all interested parties must be received by April 4, 1994. Public hearing requests must be received by March 21, 1994.

ADDRESSES: Written comments and materials concerning this proposed rule should be submitted to the Field Supervisor, Sacramento Field Office, U.S. Fish and Wildlife Service, 2800 Cottage Way, room E-1803, Sacramento, California 95825-1846. Comments and materials received will be available for public inspection, by appointment, during normal business hours at the above address.

FOR FURTHER INFORMATION CONTACT: Mr. Wayne S. White, State Supervisor, at the above address or telephone 916/978-4613.

SUPPLEMENTARY INFORMATION:

Background

The California red-legged frog (*Rana aurora draytonii*) is one of two subspecies of the red-legged frog (*Rana aurora*) found on the Pacific coast. *R. a. draytonii* was first described by Baird and Girard in 1852 from specimens collected at or near the city of San Francisco (Storer 1925). The historical range of the California red-legged frog extended from the vicinity of Point Reyes National Seashore, Marin County, California, coastally and from the vicinity of Redding, Shasta County, California, inland southward to northwestern Baja California, Mexico (Jennings and Hayes 1985, Hayes and Krempels 1986). The northern red-legged frog (*Rana aurora aurora*) ranges from Vancouver Island, British Columbia, Canada, south along the Pacific coast west of the Cascade ranges to northern California (Del Norte County). Red-legged frogs found in the intervening area (Humboldt to northern Marin County) between the two subspecies exhibit intergrade characteristics of both *R. a. aurora* and *R. a. draytonii* (Hayes and Krempels 1986). Systematic relationships between the two subspecies are not completely understood (Hayes and Miyamoto 1984, Green 1985a, Green 1986, Hayes and Krempels 1986). However, significant morphological and behavioral differences between the two subspecies suggest that they may actually be two species in secondary contact (Hayes and Krempels 1986).

Northern Marin County represents the approximate dividing line between *Rana aurora draytonii* and intergrade populations along the coastal range (M. Jennings, pers. comm., 1993). California red-legged frogs found in Nevada (Linsdale 1938, Green 1985b) were introduced. This rule would not extend

the Act's protection to any *Rana aurora* in Humboldt, Trinity, and Mendocino Counties, California, and Sonoma County, California, north and west of 38°30' N and 123° W, as well as the introduced population in Nevada.

The California red-legged frog is the largest native frog in the western United States (Wright and Wright 1949), ranging from 4 to 13 centimeters (1.5 to 5.1 inches) in length (Stebbins 1985). The abdomen and hind legs of adults are red; the back is characterized by small black flecks and larger irregular dark blotches with indistinct outlines on a brown, gray, olive, or reddish background color. Dorsal spots usually have light centers (Stebbins 1985). Dorsolateral folds are prominent on the back. Larvae range from 14 to 80 millimeters (mm) (0.6 to 3.1 inches) in length, and the background color of the body is dark brown and yellow with darker spots (Storer 1925).

Several morphological and behavioral characteristics differentiate California red-legged frogs from northern red-legged frogs. Adult California red-legged frogs are significantly larger than northern red-legged frogs by 35 to 40 mm (1.4 to 1.6 inches) (Hayes and Miyamoto 1984). Dorsal spots of northern red-legged frogs usually lack light centers common to California red-legged frogs (Stebbins 1985), but this is not a strong diagnostic character. California red-legged frogs have paired vocal sacs and call in air (Hayes and Krempels 1986), whereas northern red-legged frogs lack vocal sacs (Hayes and Krempels 1986) and call underwater (Licht 1969). Female California red-legged frogs deposit egg masses on emergent vegetation so that the egg mass floats on the surface of the water (Hayes and Miyamoto 1984). Northern red-legged frogs also attach their egg masses to emergent vegetation, but the mass is submerged (Licht 1969). California red-legged frogs breed from November to March with earlier breeding records occurring in southern localities (Storer 1925). California red-legged frogs found in coastal drainages are rarely inactive (Jennings et al. 1992), whereas those found in interior sites may hibernate (Storer 1925).

The California red-legged frog occupies a fairly distinct habitat, combining both specific aquatic and riparian components (Hayes and Jennings 1988, Jennings 1988b). The adults require a dense, shrubby or emergent riparian vegetation closely associated with deep (>0.7 meters) still or slow moving water (Jennings et al. 1992). The largest densities of California red-legged frogs currently are associated with deep-water pools with dense

stands of overhanging willows (*Salix* spp.) and an intermixed fringe of cattails (*Typha latifolia*) (Jennings 1988b). Well-vegetated terrestrial areas within the riparian corridor may provide important sheltering habitat during winter. California red-legged frogs estivate in small mammal burrows and moist leaf litter up to 26 meters (85 feet) from water in dense riparian vegetation (Rathbun et al. 1993).

Egg masses that contain about 2,000 to 5,000 moderate-sized (2.0 to 2.8 mm (0.08 to 0.11 inches) in diameter), dark reddish brown eggs are typically attached to vertical emergent vegetation, such as bulrushes (*Scirpus* spp.) or cattails (*Typha* spp.) (Jennings et al. 1992). Eggs hatch in 6 to 14 days (Jennings 1988b). The most significant mortality factor in the pre-hatching stage is water salinity (Jennings et al. 1992). One hundred percent mortality occurs in eggs exposed to salinity levels greater than 4.5 parts per thousand (Jennings and Hayes 1990). Larvae undergo metamorphosis 3.5 to 7 months after hatching (Storer 1925, Wright and Wright 1949, Jennings and Hayes 1990). Of the various life stages, larvae probably experience the highest mortality rates, with less than 1 percent of eggs laid reaching metamorphosis (Jennings et al. 1992). Sexual maturity is reached at 3 to 4 years of age (Storer 1925, Jennings and Hayes 1985). California red-legged frogs may live 8 to 10 years (Jennings et al. 1992).

The diet of California red-legged frogs is highly variable. Hayes and Tennant (1985) found invertebrates to be the most common food items. Vertebrates, such as Pacific tree frogs (*Hyla regilla*) and California mice (*Peromyscus californicus*), represented over half of the prey mass eaten by larger frogs (Hayes and Tennant 1985). Hayes and Tennant (1985) found juvenile frogs to be active diurnally and nocturnally, whereas adult frogs were largely nocturnal. Feeding activity probably occurs along the shoreline and on the surface of the water (Hayes and Tennant 1985). Larvae probably eat algae (Jennings et al. 1992).

California red-legged frogs have sustained a 75 percent reduction in their geographic range in California as a result of several factors acting singly or in combination (Jennings et al. 1992). Habitat loss and alteration, combined with overexploitation and introduction of exotic predators, were significant factors in the California red-legged frog decline in the early to mid 1900s. California red-legged frogs were extirpated from the Central Valley probably in the 1960s. Remaining aggregations of California red-legged

frogs in the Sierran foothills became fragmented and were later eliminated by reservoir construction, continued expansion of exotic predators, grazing, and drought. The pattern of disappearance of California red-legged frogs in southern California is similar to that seen in the Central Valley, except that urbanization and its associated roadway, large reservoir (exotic predators), and stream channelization projects were the primary factors causing population declines.

At present, California red-legged frogs are known to occur in about 190 streams or drainages from 15 counties in central and southern California. Monterey, San Luis Obispo and Santa Barbara Counties support the greatest amount of currently occupied habitat. The most secure aggregations of California red-legged frogs are found in aquatic sites that support substantial riparian and aquatic vegetation and lack exotic predators (e.g., bullfrogs, mosquitofish, largemouth and smallmouth bass). The majority of aggregations are threatened, however, by expansion of exotic predators, proposed residential development, water storage projects, and other factors. For example, within the Central Valley hydrographic basin, only six drainages, all on the Coast range slope of the San Joaquin Valley, are known or likely to support California red-legged frogs, compared to over 60 historic locality records for this basin. Two of these drainages, known to support significant numbers of California red-legged frogs, are sites of proposed large reservoir projects. Also, in southern California, California red-legged frogs are known from only 4 locations south of the Tehachapi Mountains, compared to over 80 historic locality records for this region. Only three areas currently support more than 350 adults.

Previous Federal Action

On January 29, 1992, the Service received a petition from Drs. Mark R. Jennings, Marc P. Hayes, and Dan C. Holland to list the California red-legged frog (*Rana aurora draytonii*). The petition specified endangered or threatened status by distinct drainages (watersheds) within the range of the species. On October 5, 1992, the Service published a 90-day petition finding (57 FR 45761) that substantial information had been presented indicating the requested action may be warranted. Public comments were requested on the status of this species. The California red-legged frog had been included as a Category 1 candidate species in the Service's November 21, 1991, Animal Notice of Review (56 FR 58804).

Category 1 candidates are species for which the Service has substantial information on biological vulnerability and threat to support proposals to list them as endangered or threatened. On July 19, 1993, the Service published a 12-month finding on the petitioned action (58 FR 38553). This finding indicated that listing of the California red-legged frog was warranted and that a proposed rule would be published promptly.

Summary of Factors Affecting the Species

Section 4 of the Endangered Species Act (16 U.S.C. 1531 *et seq.*) and regulations (50 CFR part 424) promulgated to implement the listing provisions of the Act set forth the procedures for adding species to the Federal Lists. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1). These factors and their application to the California red-legged frog (*Rana aurora draytonii*) are as follows:

A. *The present or threatened destruction, modification, or curtailment of its habitat or range.* Herpetologists have noted the decline or extirpation of California red-legged frogs from the San Francisco Bay area (Sean J. Barry, University of California, Davis, *in litt.*, 1992; Robert C. Stebbins, University of California, Berkeley, *in litt.*, 1993; John S. Applegarth, herpetologist, *in litt.*, 1993; Ed Ely, herpetologist, *in litt.*, 1993), the Salinas River drainage (Lawrence E. Hunt, University of California, Santa Barbara, *in litt.*, 1993), the San Luis Obispo, Santa Barbara, and Ventura County area (Aryan I. Roest, California Polytechnic State University, San Luis Obispo, *in litt.*, 1993; Samuel S. Sweet, University of California, Santa Barbara, *in litt.*, 1993), southern California (Patrick McMonagle, herpetologist, *in litt.*, 1993; John D. Goodman, zoologist, *in litt.*, 1992; Robert B. Sanders, San Bernardino County Museum, *in litt.*, 1992; John Stephenson, U.S. Forest Service, *in litt.*, 1993; Michael C. Long, Eaton Canyon Park Nature Center, *in litt.*, 1992; Joseph F. Copp, herpetologist, *in litt.*, 1993; Glenn R. Stewart, California Polytechnic University, Pomona, *in litt.*, 1993; Walter B. Allen, herpetologist, *in litt.*, 1993; Robert Fisher, University of California, Davis, *in litt.*, 1993), central California (Martin R. Brittan, California State University, Sacramento, *in litt.*, 1993), and the northern and southern Sierra Nevada foothills (Jay Wright, Feather River College, Quincy, *in litt.*, 1993; Alan M. McCready, California

State University, Sacramento, *in litt.*, 1992).

These observations and data provided by the petitioners indicate that the California red-legged frog has sustained a 75 percent reduction in its geographic range in California. Large aggregations of greater than 350 adults currently are known from only three areas: Pescadero Marsh Natural Preserve in coastal San Mateo County, Point Reyes National Seashore in Marin County, and canals west of San Francisco International Airport in the San Francisco Bay area (Jennings et al. 1992).

Habitat loss and alteration are primary factors that have negatively affected the California red-legged frog throughout its range. In the Central Valley of California, over 90 percent of historic wetlands have been diked, drained, or filled primarily for agricultural development and secondarily for urban development (U.S. Fish and Wildlife Service 1978). Much of the wetland habitat lost, such as in the San Joaquin Valley, was prime habitat for the California red-legged frog (Jennings and Hayes 1984). Wetland alterations, including stream channelization, clearing of vegetation, and water diversions that often accompanied agricultural development, rendered remaining aquatic sites unsuitable for California red-legged frogs. As a result, California red-legged frogs on the floor of the Central Valley were eliminated probably sometime before 1960 (Jennings et al. 1992). Remaining aggregations in drainages around the Central Valley became isolated and fragmented.

Historically, urbanization with its associated roadway, stream channelization, and large reservoir construction projects also has significantly altered or eliminated California red-legged frog habitat, with the greatest impact occurring in southern California. South of the Tehachapi Mountains in southern California, the California red-legged frog remains at only 4 of over 80 sites where it was found historically (Jennings et al. 1992). No California red-legged frogs were found during amphibian surveys in 1993 in Cleveland National Forest in southern California (J. Stephenson, pers. comm., 1993).

Urbanization poses a significant threat to the California red-legged frog. On the central California coast and south San Francisco Bay area, the Service is aware of numerous proposed residential developments that would degrade known California red-legged frog habitat either directly through on-site degradation of the stream environment or indirectly through instream flow

reductions to accommodate new urban growth (U.S. Fish and Wildlife Service unpubl. data). These projects include the East County Area Plan in Alameda County, which involves development of up to 52,000 acres, and projects currently proposed in the Ruby Hills/Arroyo Del Valle watershed and south Livermore Valley; Reservoir Canyon ponds in Santa Clara County; Alamo, Shadow, and Brookside Creeks in Contra Costa County; Potrero, San Clemente, and San Jose Creeks and the Carmel River in Monterey County; and the Santa Ynez River in Santa Barbara County. In San Luis Obispo County, one of three counties with numerous drainages supporting California red-legged frogs, proposed residential and/or recreational development adjacent to San Simeon, Santa Rosa, San Juan, Chorro, and Cambria Meadows Creeks and Estrella and Salinas Rivers would degrade or eliminate California red-legged frog habitat. Updates to area plans for the North Coast, San Luis Obispo, and Paso Robles/Atascadero areas in San Luis Obispo County propose rezoning of over 240,000 acres primarily for urban development. Between the cities of Ventura and San Luis Obispo, development already has eliminated California red-legged frogs from at least eight drainages along the coast (Galen B. Rathbun and Mark R. Jennings, U.S. Fish and Wildlife Service, *in litt.*, 1993).

Historic water projects, which accompanied urban and agricultural growth, also had a negative effect on California red-legged frogs. Construction of reservoirs, such as Lake Oroville, Whiskeytown Reservoir, Don Pedro Reservoir, Lake Berryessa, San Luis Reservoir, Lake Silverwood, Lake Piru, Pyramid Lake, and Lower Otay Lake, directly eliminated California red-legged frog habitat or fragmented remaining aggregations (Jennings et al. 1992). Reservoirs also typically are stocked with exotic species of fish and the introduced bullfrog (*Rana catesbeiana*). These species often expand into previously isolated California red-legged frog habitat. The timing and duration of water releases from reservoirs, particularly on the central California coast, can render a stream unsuitable for California red-legged frog production (M. Jennings, *in litt.*, 1993) or maintain aggregations of exotic predators in downstream areas that would normally be dry in summer (S. Sweet, *in litt.*, 1993). Hayes and Jennings (1988) found that California red-legged frogs generally were extirpated from a drainage 1 to 5 years after filling of a reservoir. See

Factor C below for further discussion of exotic predators.

A variety of proposed water projects threaten remaining California red-legged frog populations. Construction of major reservoirs is proposed on Los Banos Creek (Merced County), with Orestimba Creek (Stanislaus County) as an alternative reservoir site (California Department of Water Resources and the U.S. Bureau of Reclamation 1990), and on Kellogg Creek (Contra Costa County) (Contra Costa Water District 1993). These sites represent three of six sites remaining in the Central Valley hydrographic basin with known or potential aggregations of California red-legged frogs. On the Salinas River on the central coast, raising the height of Salinas Dam (Santa Margarita Lake) is proposed in San Luis Obispo County. Reservoir construction at this site may allow exotic predators access to formerly secure aggregations of California red-legged frogs isolated in upper portions of the watershed (L. Hunt, *in litt.*, 1993). Other large reservoir projects proposed in California red-legged frog habitat include the Upper Nacimiento River Project and Arroyo Seco Dam Project in Monterey County. In Santa Barbara and Ventura Counties, proposed dams on the Santa Ynez River, Sisquoc River, and Sespe Creek also would eliminate or degrade California red-legged frog habitat (S. Sweet, pers. comm., 1993).

Proposed or existing water diversions, well development, or small reservoir construction projects to supply residential uses on the central coast (e.g., San Simeon, Santa Rosa, Van Gordon, Villa, San Luis Obispo, Chorro, Pico, and Little Pico Creeks, Arroyo del Puerta, and Arroyo Laguna in San Luis Obispo County; the Carmel and Salinas River drainage basins in Monterey County; Canada de Refugio in Santa Barbara County) reduce instream flows and, when combined with drought, degrade or eliminate riparian habitat and create stressful conditions for California red-legged frogs. See Factor E below for additional discussion of the effects of drought. Small reservoirs also serve as a source of exotic fishes and bullfrogs (G. Rathbun and M. Jennings, *in litt.*, 1993). The proposed coastal branch of the State Water Project likely would result in a number of adverse effects to California red-legged frogs in many of the 24 areas receiving State water, including (1) altered water regimes in existing and any proposed delivery facilities of individual water districts, (2) spills, leaks, malfunctions, and operational errors that lead to introduction of exotic predators into isolated stream segments currently

occupied by California red-legged frogs, and (3) indirect effects associated with expanded urbanization.

Storm damage repair and flood control maintenance of streams is a widespread and ongoing threat to California red-legged frogs. Routine flood control maintenance includes vegetation removal, herbicide spraying, shaping of banks to control erosion, and desilting of the creek. All of these activities degrade California red-legged frog habitat. In San Luis Obispo and Santa Barbara Counties, maintenance work is planned for 14 and 11 drainages, respectively. All 25 drainages are known to be inhabited by California red-legged frogs. In Santa Barbara County, a larger channel maintenance project is proposed for a 4.5-mile stretch of the Santa Ynez River near Lompoc and a 10-mile segment of San Antonio Creek, both of which support California red-legged frog habitat. Channel maintenance at San Francisco International Airport threatens one of the three largest remaining aggregations of this subspecies.

Regular road maintenance activities involving grading in or adjacent to California red-legged frog habitat can result in increased siltation in the stream. If this siltation occurs during the breeding season, asphyxiation of eggs and small California red-legged frog larvae can result. On the upper Santa Ynez River and Sespe Creek in Los Padres National Forest, Sweet (pers. comm., 1993) observed California red-legged frog egg masses smothered with silt.

Livestock grazing is another form of habitat alteration that is contributing to declines in the California red-legged frog. Jennings et al. (1992) found livestock grazing to occur at all known historic locations of the California red-legged frog in the Central Valley hydrographic basin. Livestock grazing also has been implicated as a contributing factor in the decline and disappearance of California red-legged frogs from the lower Salinas River (L. Hunt, *in litt.*, 1993) and the San Francisco peninsula (S. Barry, *in litt.*, 1992). Two remaining aggregations of California red-legged frogs in the Central Valley hydrographic basin (Corral Hollow Ecological Reserve and Frank Raines Regional Park) are threatened by sedimentation of aquatic habitats either directly or indirectly caused by livestock grazing and off-road vehicle use (Jennings et al. 1992). Rathbun (pers. comm., 1993) reports that grazing is adversely altering California red-legged frog habitat on Pico, Van Gordon, San Simeon, Santa Rosa, Cambria

Meadows, and Cayucos Creeks in San Luis Obispo County.

Numerous studies, summarized in Behnke and Raleigh (1978) and Kauffman and Krueger (1984), have shown that livestock grazing negatively affects riparian habitat. Cattle have a disproportionately greater adverse effect on riparian and other wetland habitats because they tend to concentrate in these areas, particularly during the dry season (Marlow and Pogacnik 1985). Cattle trample and eat emergent and riparian vegetation, often eliminating or severely reducing plant cover (Gunderson 1968, Duff 1979). Loss of riparian vegetation results in increased water temperatures (Van Velson 1979), which encourage bullfrog reproduction (bullfrogs are a predator and competitor of California red-legged frogs). Riparian vegetation loss due to cattle grazing includes the loss of willows (Duff 1979), which are associated with the highest densities of California red-legged frogs (Jennings 1988b). Cattle grazing also results in increased erosion in the watershed (Lusby 1970, Winegar 1977), which results in the sedimentation of deep pools (Gunderson 1968) used by California red-legged frogs and adversely affects aquatic invertebrates (Cordone and Kelley 1961), which are common prey items of California red-legged frogs.

Off-road vehicle use adversely affects California red-legged frogs in ways similar to livestock grazing. Off-road vehicles damage riparian vegetation and increase siltation in pools. Off-road vehicles also disturb the water in stream channels and may crush eggs, larvae, juveniles or adults. California red-legged frogs were eliminated either all or in part by off-road vehicle activities at the Mojave River above Hesperia, at Rincon Station on the San Gabriel River, and at Piru Creek above Pyramid Lake (M. Jennings, pers. comm., 1993).

Timber harvest threatens California red-legged frogs through loss of riparian vegetation, which is needed for cover and water temperature regulation, and increased erosion in the watershed, which fills pools with sediment and smothers egg masses. In Santa Cruz County, timber harvest is proposed adjacent to Adams Creek (Celia Scott, private citizen, pers. comm., 1993), 1 of 12 remaining streams in the county that support California red-legged frogs.

B. Overutilization for commercial, recreational, scientific, or educational purposes. Records of harvesting California red-legged frogs for food date back to an account by Lockington (1879) of the commercial harvest of this species for the San Francisco market. From 1890 to 1900, the California red-legged frog

supported a significant commercial fishery (Smith 1895) with about 80,000 frogs harvested annually (Jennings and Hayes 1984). Counties surrounding San Francisco Bay provided the bulk of the frog harvest in the early to mid 1890s, with the Sacramento and San Joaquin Valleys increasing in importance by the end of the decade (Chamberlain 1898, Jennings and Hayes 1985). By 1900, harvest figures for California red-legged frogs fell dramatically, indicating that overharvesting may have occurred. Jennings and Hayes (1985) hypothesized that this rapid decline in the California red-legged frog population was the result of selective harvesting of the larger females. Introduction of the bullfrog in California in 1896 was probably in response to the dwindling California red-legged frog population (Jennings and Hayes 1985).

Prior to 1950, California red-legged frogs were used sporadically for research in high schools and universities. At present, the California red-legged frog is sold commercially from suppliers located outside California in the pet trade. Because the State of California prohibits possession of wild California red-legged frogs, frogs sold in the pet trade presumably are reared in captivity (M. Jennings, pers. comm., 1993). However, California red-legged frogs occur in isolated and fragmented wetland habitat on private property and are at risk from vandalism.

C. Disease or predation. There have been no documented instances of disease adversely affecting the California red-legged frog.

Few data are available on the effect of native predators on the California red-legged frog. Bitterns (*Botaurus lentiginosus*) and black-crowned night herons (*Nycticorax nycticorax*) are likely predators of adult frogs (Jennings and Hayes 1990). Juvenile California red-legged frogs, which are more active diurnally and less wary than adults, may be more susceptible to predation by diurnal predators, such as the great blue heron (*Ardea herodias*) and several species of garter snakes (*Thamnophis* sp.) (Fitch 1940, Fox 1952), including the endangered San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) (Barry 1978, Wharton et al. 1986). Recent post-metamorphs also may be particularly vulnerable to predation by garter snakes, as was found in other species of ranid frogs by Arnold and Wassersug (1978).

Introduced predators of particular concern are the bullfrog, red swamp crayfish (*Procambarus clarkii*), signal crayfish (*Pacifastacus leniusculus*), and several species of fish, including bass (*Micropterus* spp.), catfish (*Ictalurus*

spp.), sunfish (*Lepomis* spp.), and mosquitofish (*Gambusia affinis*) (Moyle 1973; Hayes and Jennings 1986, 1988). All species were introduced into California in the late 1800s and early 1900s, and through range expansions, reintroductions, and transplants have become established throughout most of the state (Riegel 1959, Bury and Luckenbach 1976, Moyle 1976).

Several researchers in central California have noted the decline and eventual disappearance of California red-legged frogs once bullfrogs become established at the same site (L. Hunt, *in litt.*, 1993; S. Barry, *in litt.*, 1992; S. Sweet, *in litt.*, 1993). Moyle (1973) attributed the disappearance of California red-legged frogs from the San Joaquin Valley and Sierran foothill region primarily to a combination of bullfrog predation and competition. All sites in the Sierra Nevada mountains that supported California red-legged frogs in the 1970s now are inhabited by bullfrogs (M. Jennings, *in litt.*, 1993). Over 65 percent of the streams or drainages currently known to support California red-legged frogs also are inhabited by bullfrogs, either in association with California red-legged frogs or in other portions of the drainage. Over the last decade, Jennings (*in litt.*, 1993) has observed bullfrogs moving upstream and/or downstream into formerly isolated California red-legged frog habitat in a number of drainages, including streams in Ventura, Santa Barbara, San Luis Obispo, Merced, Stanislaus, and San Mateo Counties. Game fish are introduced into drainages by stocking of reservoirs and ponds, dispersal and colonization, conveyance of project water from other streams inhabited by these exotics, and releases by individuals. At The Nature Conservancy Santa Rosa Plateau Reserve in Riverside County (the only site south of the Santa Clara River supporting California red-legged frogs), a docent found a school teacher attempting to introduce bullfrog tadpoles into the preserve in the 1980s (M. Jennings, *in litt.*, 1993). Once established, it is virtually impossible to eliminate bullfrogs (M. Jennings, *in litt.*, 1993; Cecil Schwalbe, National Park Service, Tuscon, Arizona, pers. comm., 1993; Frank Slavens, Woodland Park Zoological Gardens, Seattle, Washington, pers. comm., 1993).

Bullfrogs prey on California red-legged frogs (Twedt 1993; S. Sweet, *in litt.*, 1993) and other amphibians and aquatic reptiles (Schwalbe and Rosen 1988). Twedt (1993) documented 4 juvenile red-legged frogs in the contents of a total of 22 adult bullfrog stomachs. He also found a subadult bullfrog in one

of the adult bullfrog stomachs; this prey item was between the size of an adult male (approximately 55 millimeters (2 inches)) and adult female (approximately 70 millimeters (3 inches)) red-legged frog, indicating that bullfrogs also undoubtedly prey on adult red-legged frogs. Bullfrogs may have a competitive advantage over red-legged frogs because of their (1) larger size, (2) generalized food habits (Bury and Whelan 1984), (3) extended breeding season (Storer 1933), which allows for production of two clutches of eggs during a breeding season (Emlen 1977), (4) apparent olfactory rejection of larvae by predatory fish (Kruse and Francis 1977), and (5) diminished activity periods (Woodward 1983), which also reduces their exposure to predators. Bullfrogs also interfere with red-legged frog reproduction. Several researchers have noted red-legged frogs in amplexus (mounted on) with bullfrogs (Jennings and Hayes 1990; Twedt 1993; M. Jennings, *in litt.*, 1993; Stebbins *in litt.*, 1993). However, the extent to which bullfrog predation, competition, and reproductive interference adversely affects red-legged frogs has not been studied in the field (Hayes and Jennings 1986). Habitat alterations, including removal of riparian or aquatic vegetation, reduced stream flows, and sedimentation of pools, often provide conditions detrimental to red-legged frogs but favorable to bullfrogs (Hayes and Jennings 1986; Jennings, pers. comm., 1993).

Hayes and Jennings (1986, 1988) noted an inverse correlation between the abundance of introduced fish species and red-legged frogs. Aquatic sites where introduced fishes were abundant rarely had native ranids, and when present, ranid populations were small. A similar negative correlation was reported by Hunt (*in litt.*, 1993) for red-legged frogs in the Salinas River drainage and by Moyle (1973) for the foothill yellow-legged frog (*Rana boylei*). Stocking of warm water game fish is often included as a mitigation measure in proposed reservoir projects. Results of a recent study indicate that, despite their small size, mosquitofish do prey on and incapacitate red-legged frog tadpoles by eating their fins. This mosquitofish predation may be more significant than predation by bluegill (*Lepomis macrochirus*) or bullfrogs (Michael Soule and Randy Schmieder, University of California, Santa Cruz, pers. comm., 1993). Mosquitofish have become established statewide and are stocked routinely by mosquito abatement districts as a control measure

(Moyle 1976). The demonstrated adverse effects and widespread distribution of alien fishes on red-legged frogs indicate that fish introductions are one of the primary threats to the survival of the species.

D. *The inadequacy of existing regulatory mechanisms.* In 1972, the California Fish and Game Commission amended its sport fishing regulations to prohibit take or possession of California red-legged frogs (Bury and Stewart 1973). This law, however, provides no protection for habitat of the California red-legged frog. The California red-legged frog also is classified as a "Species of Special Concern" in California (Steinhart 1990). This designation, however, provides no special, legally mandated protection.

The Clean Water Act (section 404) is the primary Federal law that could provide some protection for aquatic habitats of the California red-legged frog if the habitats are determined by the U.S. Army Corps of Engineers (Corps) to be jurisdictional areas (i.e., waters of the United States). Under section 404, nationwide permits, which undergo minimal public and agency review, can be issued for projects involving less than 10 acres of wetlands above the headwaters (i.e., streams with less than 5 cubic feet per second (cfs) mean annual flow) or for isolated waters, unless a listed species may be adversely affected. Many aggregations of California red-legged frogs occur in isolated wetlands and coastal streams that may have mean annual flows less than 5 cfs. Individual permits, which are subject to more extensive review, could be required for projects that have more than minimal impacts to waters of the United States. The Clean Water Act does not afford any special protection for candidate species. However, if the California red-legged frog is listed, the Corps would be required by section 7 of the Act to consult and obtain the concurrence of the Service prior to the authorization of any section 404 permit.

Federal lands, including those of the Forest Service, National Park Service, Bureau of Land Management, and Department of Defense, encompass approximately 10 percent of the current known range of the California red-legged frog. Multiple land use management, as currently practiced by the Forest Service, Bureau of Land Management, and National Park Service, does not provide long-term protection for the California red-legged frog.

E. *Other natural or man-made factors affecting its continued existence.* Four consecutive years of drought in California (1986–1990) severely affected remaining California red-legged frogs in

the Sierra foothills. According to the petitioners, several thousand hours of field surveys have revealed only one California red-legged frog since 1985 (Jennings et al. 1992). Many sites in intermittent streams that held California red-legged frogs before the drought were completely dry during field surveys. Sites still holding pools of water had water levels so low that access by predators was enhanced. Livestock grazing at many sites exacerbated effects of the drought by limiting or preventing riparian habitat regeneration (Jennings et al. 1992). Jennings et al. (1992) concluded that California red-legged frogs have been extirpated from the Sierra Nevada foothills or are extremely rare and vulnerable. Amphibian surveys of Sierran National Forests in 1992 revealed no California red-legged frogs (David Martin, University of California, Santa Barbara, pers. comm., 1993).

On the central California coast, drought also may play a role in decreased California red-legged frog reproduction where frogs occur in coastal lagoons. At Pescadero Marsh Natural Preserve, Jennings and Hayes (1990) found that many dead egg masses in a portion of the marsh likely were killed by excessive (> 4.5 parts per thousand) salinity levels. High salinities in the marsh were attributed to drought conditions in the watershed. Rathbun et al. (1991) attributed the absence of California red-legged frogs in lower Santa Rosa Creek and lagoon in San Luis Obispo County to overallocation of instream flows exacerbated by the drought. Increased salinities were recorded in several other coastal lagoons during the drought years (C. Swift and K. Worcester, pers. comm. in Jennings et al. 1992). In 1993, Jennings (pers. comm., 1993) reported the loss of California red-legged frog egg masses from increased salinity in Arroyo Laguna in San Luis Obispo County. Because significant numbers of California red-legged frogs occur in coastal lagoons on the central California coast, drought has the potential to severely reduce production of California red-legged frogs over a significant portion of their remaining range.

Reservoirs provide persistent habitat for bullfrogs during drought. Once rains return, bullfrogs recolonize former habitat as reservoir levels rise. Reservoirs, however, with their steep sides and lack of critical riparian vegetation, are structurally unsuitable for the California red-legged frog.

Periodic wildfires may adversely affect California red-legged frogs by causing direct mortality, destroying streamside vegetation, or eliminating vegetation that protects the watershed.

The 1991 Lions Fire on upper Sespe Creek in the Los Padres National Forest destroyed known California red-legged frog habitat (S. Sweet, pers. comm., 1993). Following the fire, extensive erosion in the watershed also negatively affected California red-legged frogs (S. Sweet, pers. comm., 1993).

Extensive flooding has been implicated by Jennings and Hayes (in press) as a significant contributing factor in the extirpation of the California red-legged frog from desert drainages of southern California. For example, in the Mojave River drainage, no verifiable records or sightings exist of California red-legged frogs after 1968 (Jennings and Hayes in press). The disappearance of this species from the drainage coincided with a catastrophic flood event in the Mojave River in the winter of 1968–1969.

The high degree of fragmentation of remaining California red-legged frog habitat makes this subspecies especially vulnerable to random extinction events and to loss of genetic variability. Small population size increases rates of inbreeding and may allow expression of deleterious recessive genes occurring in the population (known as “inbreeding depression”). Loss of genetic variability, through random genetic drift, reduces the ability of small populations to respond successfully to environmental stresses. In the remaining vestiges of its former habitat and with its potentially reduced genetic variability, the California red-legged frog is vulnerable to random or stochastic events, such as fluctuations or variations of annual weather patterns (as discussed above), availability of food, predation and associated demographic uncertainty, or other environmental stresses. With only three areas currently supporting over 350 adults, all remaining populations of the species are considered vulnerable to stochastic threats.

The Service carefully has assessed the best scientific and commercial information available regarding the past, present, and future threats faced by the California red-legged frog in determining to propose this rule. Based on this evaluation, the preferred action is to list the California red-legged frog (*Rana aurora draytonii*) as endangered. This subspecies has been extirpated from 75 percent of its former range. Seventy-seven percent of remaining aggregations currently are threatened by one or more factors, including (1) introduction of exotic predators and competitors, (2) urban encroachment, (3) construction of large and small reservoirs, water diversions and well development, (4) flood control maintenance, (5) grazing, and (6) timber

harvest. Only 44 drainages, with the majority being in Monterey, Santa Barbara, and San Luis Obispo Counties, currently provide habitat free from the above threats. Fragmentation of habitat, however, renders these populations vulnerable to random extinction (stochastic) events. For the reasons discussed below, critical habitat is not being proposed at this time.

Critical Habitat

Section 4(a)(3) of the Act, as amended, and implementing regulations (50 CFR 424.12) require that, to the maximum extent prudent and determinable, the Secretary propose critical habitat at the time a species is proposed to be endangered or threatened. The Service finds that designation of critical habitat is not presently prudent for the California red-legged frog.

As discussed under Factor B in the “Summary of Factors Affecting the Species” section, the California red-legged frog has been and continues to be threatened by taking, an activity difficult to control. Listing of the frog may result in an increase in the threat of vandalism, a concern expressed by the petitioners and other experts (M. Jennings, S. Sweet, pers. comms., 1993). California red-legged frogs occur in isolated and fragmented wetland habitat on private property and are at risk from vandalism. Publication of specific localities, which would be required in proposing critical habitat, would reveal precise locality data and thereby make the species more vulnerable to collection and acts of vandalism, and increase the difficulties of enforcement. Protection of this species’ habitat will be addressed in the recovery process and through the section 7 consultation process. Therefore, it would not now be prudent to determine critical habitat of the California red-legged frog.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Endangered Species Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain activities. Recognition through listing encourages and results in conservation actions by Federal, State, and private agencies, groups, and individuals. The Act provides for possible land acquisition and cooperation with the States and requires that recovery actions be carried out for all listed species. The protection required of Federal agencies and the prohibitions against taking and harm are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer informally with the Service on any action that is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service.

Federal agencies that may be involved as a result of this proposed rule are the Bureau of Reclamation, Bureau of Land Management, National Park Service, Forest Service, and the Departments of the Army, Navy and Air Force. At several parks, the National Park Service has conducted or is planning to conduct surveys of California red-legged frogs on park property (Daphne A. Hatch, National Park Service, *in litt.*, 1993; James Sleznick, National Park Service, *in litt.*, 1992; Gary Fellers, National Park Service, pers. comm., 1993). The Forest Service has conducted and has ongoing amphibian surveys in many National Forests within the historic range of the California red-legged frog (J. Stephenson, pers. comm., 1993; D. Martin, pers. comm., 1993). The Bureau of Reclamation is cosponsoring a proposed reservoir construction project (Los Vaqueros Reservoir) on Kellogg Creek, Contra Costa County (Contra Costa Water District 1993). A mitigation and monitoring program is proposed to compensate for California red-legged frog habitat losses. The mitigation plan includes a bullfrog and exotic fish control program to be carried out for the life of the reservoir project (Contra Costa Water District 1993). The potential for success of the mitigation plan is unknown. The proposed Los Banos Grande reservoir project on Los Banos Creek in Merced County, also cosponsored by the Bureau of Reclamation, does not provide mitigation specifically for the California red-legged frog (Cay Goude, Fish and Wildlife Service, pers. comm., 1993).

The U.S. Army Corps of Engineers would be involved through their permitting authority under section 404 of the Clean Water Act. Any of the above mentioned Federal agencies would be required to consult with the Service if any action they fund, authorize, or carry out is likely to jeopardize the continued existence of the California red-legged frog.

The Act and implementing regulations found at 50 CFR 17.21 set forth a series of general prohibitions and exceptions that apply to all endangered wildlife. With respect to the California red-legged frog, these prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to take (including harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt any such conduct), import or export, transport in interstate or foreign commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. It also is illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to agents of the Service and State conservation agencies.

Permits may be issued to carry out otherwise prohibited activities involving endangered and threatened wildlife species under certain circumstances. Regulations governing permits are at 50 CFR 17.22 and 17.23. Such permits are available for scientific purposes, to enhance the propagation or survival of the species, and/or for incidental take in connection with otherwise lawful activities. Requests for information on permits should be addressed to the Assistant Regional Director, Ecological Services, U.S. Fish and Wildlife Service, 911 NE. 11th Avenue, Portland, Oregon 97232-4181 (503/231-6241; FAX 503/231-6243).

Public Comments Solicited

The Service intends that any final action resulting from this proposal will be as accurate and as effective as possible. Therefore, comments or suggestions from the public, other concerned governmental agencies, the scientific community, industry, or any other interested party concerning this proposed rule are hereby solicited. Comments particularly are sought concerning:

(1) Biological, commercial trade, or other relevant data concerning any threat (or lack thereof) to the California red-legged frog;

(2) The location of any additional populations of the California red-legged frog and the reasons why any habitat should or should not be determined to

be critical habitat as provided by section 4 of the Act;

(3) Additional information concerning the range, distribution, and population size of the California red-legged frog;

(4) Any examples of take or vandalism of California red-legged frogs; and

(5) Current or planned activities in the subject area and their possible impacts on the California red-legged frog.

Any final decision on this proposal will take into consideration the comments and any additional information received by the Service, and such communications may lead to a final regulation that differs from this proposal.

The Endangered Species Act provides for a public hearing on this proposal, if requested. Requests must be received within 45 days of the date of publication of this proposal in the **Federal Register**. Such requests must be made in writing and addressed to the Field Supervisor of the Sacramento Field Office (see **ADDRESSES** section).

National Environmental Policy Act

The Fish and Wildlife Service has determined that an Environmental Assessment, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared in connection with regulations adopted pursuant to section 4(a) of the Endangered Species Act of 1973, as amended. A notice outlining the Service's reasons for this determination was published in the **Federal Register** on October 25, 1983 (48 FR 49244).

References Cited

A complete list of all references cited herein is available upon request from the Field Supervisor, Sacramento Field Office (see **ADDRESSES** section).

Author

The primary author of this proposed rule is Karen J. Miller, Sacramento Field Office (see **ADDRESSES** section), telephone 916/978-4866.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Proposed Regulation Promulgation

Accordingly, the Service hereby proposes to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—[AMENDED]

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 16 U.S.C. 1531–1544; 16 U.S.C. 4201–4245; Pub. L. 99–625, 10080 Stat. 3500, unless otherwise noted.

2. Section 17.11(h) is amended by adding the following, in alphabetical order under Amphibians, to the List of Endangered and Threatened Wildlife to read as follows:

§ 17.11 Endangered and threatened wildlife

* * * * *

(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
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Amphibians							
Frog, California red-legged.	<i>Rana aurora draytonii</i> .	U.S.A. (CA)	Entire (excluding populations in Humboldt, Trinity, and Mendocino Cos., CA; Sonoma Co, CA, north and west of 38° 30' N, 123° W; and NV).	E	NA	NA
.

Dated: January 26, 1994.

Mollie H. Beattie,

Director, Fish and Wildlife Service.

[FR Doc. 94–2303 Filed 2–1–94; 8:45 am]

BILLING CODE 4310–55–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 661

[Docket No. 940120–4020; I.D. No. 011094A]

RIN No. 0648–AE05

Ocean Salmon Fisheries Off the Coasts of Washington, Oregon, and California

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule.

SUMMARY: The Secretary of Commerce (Secretary) requests public comments on a proposed rule to implement Amendment 11 (amendment) to the Fishery Management Plan for Commercial and Recreational Salmon Fisheries Off the Coasts of Washington, Oregon, and California (FMP). Amendment 11 would modify the spawning escapement goal for Oregon coastal natural (OCN) coho salmon and the criteria for establishing and managing subarea allocations for recreational coho salmon harvest south of Cape Falcon, Oregon (45°46'00" N. lat.). The amendment is intended to: (1) Address persistent low OCN coho stock

abundance and annual escapement goals below maximum sustainable yield (MSY); (2) to prevent imbalances in recreational coho harvest allocation at low allowable harvest levels; and (3) to prevent the frequent use of emergency rulemaking to implement annual management measures.

DATES: Written comments on the amendment and the proposed rule must be received by March 21, 1994.

ADDRESSES: Comments should be sent to J. Gary Smith, Acting Director, Northwest Region, National Marine Fisheries Service, 7600 Sand Point Way NE., BIN C15700-Bldg. 1, Seattle, WA 98115-0070, or Dr. Gary Matlock, Acting Director, Southwest Region, National Marine Fisheries Service, 501 West Ocean Blvd., suite 4200, Long Beach, CA 90802–4213. Copies of the amendment, including the environmental assessment and the regulatory impact review/initial regulatory flexibility analysis, are available from Lawrence D. Six, Executive Director, Pacific Fishery Management Council, Metro Center, suite 420, 2000 SW. First Avenue, Portland, OR 97201–5344.

FOR FURTHER INFORMATION CONTACT: William L. Robinson at 206–526–6140, Rodney R. McInnis at 310–980–4040, or Lawrence D. Six at 503–326–6352.

SUPPLEMENTARY INFORMATION: The ocean salmon fisheries in the exclusive economic zone of the United States (3 to 200 miles offshore) in the Pacific Ocean off the coasts of Washington, Oregon, and California are managed under the FMP. The FMP was developed by the Pacific Fishery Management Council (Council) under

the Magnuson Fishery Conservation and Management Act, 16 U.S.C. 1801 *et seq.* (Magnuson Act), and approved by the Secretary in 1978. Since then, the FMP has been amended 10 times, with implementing regulations codified at 50 CFR part 661. From 1979 to 1983, the FMP was amended annually. In 1984, a framework amendment was implemented that provided the mechanism for making preseason and inseason adjustments in the regulations without annual amendments. Amendments to the framework FMP were implemented in 1987, 1988, 1989, and 1991.

The Council prepared Amendment 11 to the FMP and submitted it to the Secretary for approval under the provisions of the Magnuson Act. On January 10, 1994, the Secretary began formal review of the amendment. A notice of availability for Amendment 11 was filed with the Office of the Federal Register on January 14, 1994, announcing a public comment period on the amendment.

The FMP amendment process for Amendment 11 was initiated at the April 6–9, 1993, Council meeting with the presentation of several alternative proposals by the Oregon Department of Fish and Wildlife (ODFW) to address OCN coho salmon management concerns. Council discussions at its September 15–17, 1993, meeting identified three alternatives, in addition to the status quo, requiring further analyses. A draft amendment was prepared and distributed to interested persons for review in October 1993. Comments were invited, and public hearings were held November 8–10,

1993, in Tillamook and Coos Bay, Oregon, and Eureka, California (58 FR 57978, October 28, 1993). During the public hearings, the ODFW and the California Department of Fish and Game (CDFG) presented for Council consideration a joint recommendation regarding recreational allocation.

After considering the comments received on the draft amendment at the public hearing and Council meetings, and from its Salmon Technical Team, Salmon Advisory Subpanel, and Scientific and Statistical Committee, the Council, at its November 17-19, 1993, meeting, selected the preferred alternative, which is based on the joint recommendation by the ODFW and CDFG. The Council's recommendation is a modification of the alternatives described in the draft amendment for public review and falls within the scope of those alternatives.

The purpose of Amendment 11 is to modify the spawning escapement goal for OCN coho salmon, and the criteria for establishing and managing, when harvest levels are low, subarea allocations for recreational coho salmon harvest south of Cape Falcon, Oregon. The OCN coho stock is composed of naturally produced coho salmon from Oregon coastal streams. OCN coho are important contributors to the ocean salmon harvest, as the stock aggregate constitutes the largest component of naturally produced coho caught in ocean salmon fisheries off Oregon and California. In any given year, OCN coho stock numbers are used to set the allowable coho harvest rate for combined natural and hatchery production for the area south of Cape Falcon.

Spawning Escapement Goal

Prior to 1987, the OCN coho spawning escapement goal was 200,000 adults, the MSY spawning escapement level determined by the ODFW. The current method of determining the OCN coho spawning escapement goal and harvest rate was adopted by the Council in 1986 and implemented by Amendment 7 to the FMP beginning in 1987.

Amendment 7 established an OCN spawning escapement goal floor of 135,000 coho for estimated ocean abundances of up to 270,000 coho. the spawning escapement goal changes to 50 percent of the ocean abundance (50 percent harvest rate) for ocean abundances between 270,000 and 400,000 coho, and is capped at 200,000 coho for ocean abundances above 400,000 coho.

Amendment 7 was intended to allow some additional harvest in years when unusual conditions such as the 1983 El

Niño might temporarily reduce stock abundance below 400,000 coho. The analysis supporting Amendment 7 indicated that implementing the amendment would provide increased economic benefits with a low likelihood that occasionally allowing the spawning escapement to drop to the floor level of 135,000 would jeopardize the continued productivity of the OCN stock.

The analysis supporting deviations from the fixed 200,000 spawning escapement goal at low stock sizes assumed that such deviations would occur infrequently. However, since 1985 the annual spawning escapement goal has been set below the 200,000 MSY level 50 percent of the time, and since 1979 the actual spawning escapement has met or exceeded 200,000 coho in only a single year, 1984. During this same period, the post-season estimates of total OCN stock size have not exceeded 360,000 coho salmon, compared to the 700,000 stock size that is believed to represent the MSY level. The reasons for this extended stock depression are not completely understood. Factors contributing to the decline of OCN coho include widespread and significant degradation of freshwater habitat, an extended period of poor ocean survival, and overestimation of stock abundance.

The methodology for predicting the ocean abundance of OCN coho south of Cape Falcon has had mixed results since 1984. Despite a rigorous technical review of the OCN predictor by the Council in 1987, the predictor has consistently and significantly overestimated preseason abundance since its adoption in 1988. As a result, the formula in the FMP for calculating the spawning escapement goal and associated ocean harvest rate for OCN coho has resulted in overharvest and spawning escapement falling short of its goal for the past 6 years.

In April 1991, the Council established an overfishing work group to review the status of OCN coho. This assessment was completed in February 1992 and included a review of the stock abundance predictor. While the current methodology was under review, the Council was not able to implement a new methodology that was more reliable than the current predictor for estimating ocean abundance. To compensate for the overestimation bias in the current predictor, the Council relied on emergency regulations in 1991, 1992, and 1993 to reduce the ocean harvest rate on OCN coho from the levels set in Amendment 7, thus allowing additional natural spawners to escape the ocean fisheries.

Amendment 11 would modify the OCN coho spawning escapement goal so as to achieve an aggregate OCN adult spawning density of 42 naturally spawning adults per mile in standard index survey areas each year. The standard index survey areas are 48 different stream sections that have been surveyed by ODFW each year since 1950. Under the current methods used by ODFW, the number of spawners in the standard index area is extrapolated for 4,764 miles of coastal spawning habitat. This translates to a numerical spawning escapement goal of 200,000. The original FMP spawning escapement goal of 200,000 was based on this expansion. This number of adult spawners per mile was documented as the estimated MSY spawning escapement level in an ODFW study of coastal stream spawning escapements and subsequent production from 1950 to 1980. The ODFW is currently in the fourth year of a 5-year study to confirm the relationship between the number of natural spawners counted in standard index survey areas and the total OCN coho salmon spawning populations. This study may provide a better definition of the total OCN coho spawning population when it is completed, and the results may lead to revisions in the estimated total number of spawners at the MSY level that is calculated by extrapolating from the 42 adults per mile in the standard index survey areas. This type of change would not necessitate any further changes to the FMP or its implementing regulations. If further studies result in recommended changes to the optimum number (42) of adult spawners per mile in the standard index survey areas, the FMP will need to be amended or, if the change is purely technical, the spawning escapement goal may be revised through the framework provided in 50 CFR 661, Appendix IV.B. At this time, however, Amendment 11 represents the best available science.

Amendment 11 also states that when OCN coho abundance is forecast to be less than 125 percent of the annual numerical escapement goal, or below 250,000 fish at the present spawner escapement goal of 200,000 adults, an incidental exploitation rate of up to 20 percent would be allowed for ocean and freshwater fisheries targeting on non-OCN coho salmon stocks. Concern was expressed that, when OCN coho abundance forecasts are below 168,750, the proposal for up to a 20 percent incidental harvest rate could allow OCN coho spawning escapements below the 135,000 fish floor currently contained in the FMP. In response to this concern,